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NEMATODE DISEASES OF PEANUT

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The peanut root-knot nematode, Meloidogyne arenaria (Neal) Chitwood, is the most important soil pest of peanut in Florida. There are two other less important nematode pests of peanut in Florida, lesion nematode, Pratylenchus brachyurus (Godfrey) Goodey) and ring nematode, Criconemella ornata (Raski). All three genera are distributed widely in north-central and western Florida where the primary peanut plantings occur. However, it is the root-knot disease that has been increasing in occurrence on peanut (Arachis hypogaea L.). Too frequent planting on infested land has led, in many cases, to severe yield losses. Whereas root-knot is a well recognized disease of peanut in Florida, much less is known about the importance of lesion and ring nematodes. Both genera are encountered more frequently in peanut fields than root-knot nematodes, and the damage they inflict is much more difficult to estimate. Losses caused by the peanut root-knot nematode often range from ½ to 2 tons per acre. The best estimates of the most severe losses induced by lesion and ring nematodes range from 400 to 600 lbs per acre. Yet, these two genera probably cause larger losses overall because of their ubiquitous nature.

ROOT-KNOT NEMATODES: Meloidogyne arenaria was described by Chitwood (1) from diseased peanuts in Georgia. Two host races of M. arenaria were proposed in 1978 (9): Race 1 infects and reproduces on peanut and Race 2 does not. They are morphologically identical and can only be separated based on their reaction on peanut (8) Both races are widespread in north-central and western Florida where they cause serious losses to agronomic, vegetable, ornamental, and fruit crops (4). Race 1 appears to be more common than Race 2 in Florida; however, most populations of M. arenaria are Race 2 worldwide (12).

Peanut plants grown in soil infested with the peanut root-knot nematode will generally show noticeable above- and below-ground symptoms. The soil contains numerous root-knot nematode eggs and infective juveniles. The juveniles are distributed in the soil to a depth of at least 48 inches. In fact, the largest numbers are generally found at the time of planting in the deeper levels (24 to 48 inches) (6). Egg masses are encountered on roots during the growing season, but their presence drops off significantly after peanut harvest. Thus, since juveniles are found throughout the year, they constitute the major survival stage.

Juveniles infect peanut roots soon after planting; noticeable galling and egg masses are apparent on the roots 55 to 90 days after planting. The characteristic symptom of root-knot disease is the abnormal swellings (galls) of the roots (Fig. 1). Galling on peanut roots is not as easily detected as on many other more succulent root systems, e.g., tomato, tobacco, squash, okra, etc. Galls on peanut roots are small and generally discrete, whereas galling on other host crops may be large and coalesced. Nematode galls are distinguishable from rhizobium nodules as nodules are distinct round swellings that appear to be attached to the root and are easily detached, whereas nematode galls are swellings that constitute a part of the fibrous root system. However, the juveniles may infect and reproduce in the rhizobium nodules. They cannot be removed without destroying the integrity of the root. Soon after blooming and initiation of pod set (generally about 45 days after planting), root-knot nematode juveniles may infect pegs and pods. Early infection may result in a weakened peg so that pods are lost in the soil or fall off during

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harvesting. Shells of pods that set may become heavily infected and extensively galled (Fig. 2) late in the season and this situation results in drastic yield losses. Peanut plants are especially vulnerable to nematode infection late in the season, thus making it one of the most challenging crops for practicing nematode management techniques. Definite above-ground symptoms will appear 75 to 90 days following planting. Heavily infected plants will be stunted, chlorotic, and will set few pods (Fig. 3). If drought occurs near the end of the season, it may greatly increase the severity of root-knot disease, and weakened plants may die.

LESION NEMATODE: Steiner (10,11) first reported the lesion nematode, P. brachyurus, on peanut in Alabama (1942) and Virginia (1945). This nematode is now known to occur on peanuts throughout the southeastern USA (7).

The lesion nematode is a migratory endoparasite. All life stages except the egg and males are infective. The nematode may penetrate anywhere on roots, pegs, or pods. The pod shell tissue is more favorable for reproduction with six to eight times greater numbers occurring in it as in an equal portion of root tissue (3). Unfortunately, distinct field symptoms are difficult to discern. Under unusually heavy infection, peanut plants may be stunted and chlorotic. Roots, pegs, pods, and shells will harbor the nematode. Infected peanut shells are a source of inoculum even after one year of storage. Extraction of the nematode is possible by incubating these tissues in a Baermann funnel or by other root extraction techniques. The most obvious symptoms of lesion nematode are small, purplish-brown to black lesions that form on the mature shell (Fig. 4). These lesions have distinct boundaries and first appear as small brown tunnels in the shell which later coalesce and appear as large lesions. Secondary soil-borne pathogens may enter these lesions causing peg and pod rots. Yield losses occur when pegs weakened by the nematode either rot or are lost in the soil at harvest.

RING NEMATODES: Criconemella ornata is a common parasite of peanut in Florida as well as other regions of the southeastern USA (7). Relatively large numbers are encountered frequently in association with peanut roots, pegs, and pods, and yet little loss in yield or quality may be noticed.

The ring nematode is an ectoparasite. It feeds on the outside of roots by thrusting its long stylet into the root tissue. Little information is available on its life cycle. Some species of ring nematodes complete their life cycle in 25 to 34 days. Females lay single eggs in the soil at the rate of one to eight eggs per day (7). Obvious field symptoms of ring nematodes are seldom seen. However, Machmer (5) reports a yellowing of peanut vines in soil heavily infested with ring nematodes in Georgia. Other symptoms may be stunting and small brown necrotic lesions on roots and pods.

MANAGEMENT: Nematodes of peanut are managed most commonly by crop rotation and nematicide applications (2). Peanut can be produced successfully in fields where poor hosts or nonhosts of the peanut root-knot nematode are grown in the rotation. Small grains or pasture grasses are generally used. Peanut should not follow soybean or most vegetables. Field corn is only fair as a rotation crop because it supports populations of M. arenaria. It is, however, better than continuous planting of peanut or planting of peanut followed by soybean or vegetables. Long term rotations of three or more years are better than short term rotations. There are no peanut cultivars resistant to any of the nematode diseases of peanut in Florida.

Fumigant or nonfumigant nematicides may be applied where significant nematode problems are expected. The preplant fumigant nematicide, 1,3-dichloropropene, is the

most reliable nematicide for reducing effects of root-knot nematodes. It must be used as a preplant treatment and placed at least 14 inches below the final soil surface. A waiting period of 7 days is suggested before planting.

Nonfumigant nematicides, i.e., aldicarb, carbofuran, ethoprop, fenamiphos, and oxamyl have registered uses on peanut and may be applied preplant or at planting. An additional application (at early bloom) of aldicarb, carbofuran, ethoprop, and oxamyl is approved. In most years, substantial yield increases were obtained when these compounds were tested with an application at early bloom following an at-plant treatment of a fumigant nematicide.

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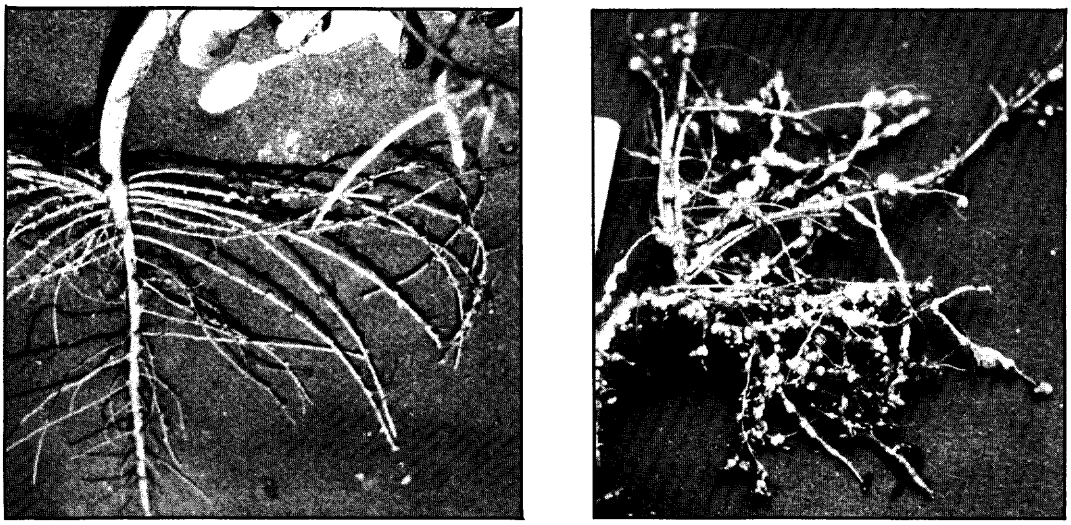

Fig. 1. Healthy (left) and root-knot nematode infected peanut roots (right) exhibiting typical symptoms of galling and root proliferation in the vicinity of the galls.

Fig. 3. Peanut planting showing a root-knot nematode infested area exhibiting symptoms induced by the nematode of chlorosis, stunting, and stand reduction.

Fig. 2. Peanut peg and pods heavily galled with the peanut root-knot nematode.

Fig. 4. Peanut pods showing typical lesions induced by the lesion nematode, Pratylenchus brachyurus.